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Synthesis and high thermal conductivity in cubic BAs and BP crystals SHENG LI, The University of Texas at Dallas,Richardson, Texas 75080, QIYE ZHENG, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801, XIAOYUAN LIU, RYAN LITTLE, The University of Texas at Dallas, Richardson, Texas 75080, EVAN GLASER, Naval Research Laboratory, Washington, D.C. 20375, DAVID BROIDO, Boston College, Chestnut Hill, Massachusetts 02467, DAVID CAHILL, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801, BING LV, The University of Texas at Dallas, Richardson, Texas 75080, BOSTON COLLEGE TEAM, NAVAL RESEARCH LABORATORY TEAM, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN TEAM, THE UNIVERSITY OF TEXAS AT DALLAS TEAM — The zinc blende cubic BAs and BP, due to their potential ultra-high thermal conductivity (κ) calculated through first principle approach, have attracted significant research efforts in the past few years. In order to experimentally verify the predicted high κ values, high quality defect-free single crystal growth is needed to eliminate phonon scattering caused by defects such as deficiency, anti-site defects, voids, impurities, twin/grain boundaries. Herein, we have carried out systematical studies to: 1) find out the suitable crystal growth techniques for BAs and BP despite many challenges ; 2) investigate the growth mechanism to optimatize the crystal growth; and 3) grow large size of BAs and BP crystals up to 1.5 mm size where a high κ up to 600 W/m/K is obtained from time-domain thermoreflectance (TDTR) measurments. The obtained κ value is much higher than that of AlN (˜400 W/m/K), and is only smaller than that of C-based diamond and nanotube/graphene.

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